Electronic transactions

Field of the Invention

5   The present invention relates to electronic transactions, and
in particular, but not exclusively, to electronic
transactions that are processed by means of an electronic
device such as a mobile user equipment.

10   Background of the Invention

Various user equipment such as computers (fixed or portable)
mobile telephones, personal data assistants or organisers and
so on are known by the skilled person. A user equipment can
15   be defined as a means that the user may use for different
tasks such as for processing information and/or for
communication. A mobile user equipment referred to as mobile
station can be defined as means that is capable of
communication via a wireless interface with another device
20   such as a base station of a mobile telecommunication network
or any other station. Such a mobile user equipment can be
adapted for voice, text message or data communication via the
wireless interface.

25   A user equipment could also be used for exchange of
confidential or private information such as exchange of data
that associates with electronic transactions between two or
more parties. The possible electronic transactions could
include, without restricting the scope of this specification
30   to these, transactions such as ordering of goods and/or
services, transactions that associate with payment of
purchased goods and/or services, provision of a receipt or
other confirmation of payment or purchase, financial services

(e.g. different banking services), betting services and so on.

A user equipment could also be used for exchange and/or
5   storage of other confidential information such as personal
identification data, passport data and so on. It shall thus
be appreciated that in this specification the term
'transaction' is not restricted to commercial transactions
between at least two parties but instead the term transaction
10   refers to exchange of any confidential information.

A common transaction mechanism is required so that electronic
transactions can be accomplished between two entities. In
general term, a typical transaction mechanism can be defined
15   to comprise features such as the communication media between
the parties, predefined transaction protocols and parameters,
predefined content transfer and presentation formats,
security mechanisms and other functions that may also
associate with an electronic transaction between the parties.
20

The inventors have found that at the present there is no
common transaction mechanism that could be used by a user
equipment for electronic transactions with different parties
and/or for situations where a transaction involves a new
25   party. Instead, a user of a user equipment may be prevented
from the transaction for simple reason that his/hers user
equipment cannot co-operate with the other party of the
transaction. In addition, the inventors have also found that
it could be advantageous if the transaction mechanisms of a
30   user equipment could be modified from time to time e.g. for
security reasons or to keep the user equipment updated with
the most recent developments of the electronic transaction
mechanisms. It could also be advantageous if a transaction

mechanism could be initiated i.e. invoked based on a request by the user.

Summary of the Invention

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Embodiments of the present invention aim to address one or several of the above problems by providing a way to modify the transaction mechanism at a user equipment.

10 According to one aspect of the present invention, there is provided a method in a user equipment for enabling use thereof in electronic transactions, the method comprising: receiving at the user equipment control information from a management entity; and providing the user equipment with

15 transaction means based on the received control information.

Existing transaction means of the user equipment may be modified or updated or at least one parameter for use in electronic transactions by the user equipment is changed

20 based on said information from the management entity. The transaction means may also be initiated at the user equipment based on said information from the management entity.

Said information may be included in a data entity. The data

25 entity may be based on an electronic data card format.

According to another aspect of the present invention there is provided an arrangement for processing electronic transactions comprising: a user equipment; a transaction

30 service entity adapted to generate control information to be transported to the user equipment; and communication means for communication between the user equipment and the transaction service entity, wherein the arrangement is such

that the user equipment can be provided with transaction means based on said control information transported to the user equipment via said communication means.

5 The embodiments of the invention may provide advantage since they may provide a feasible modification of the transaction mechanism. A user equipment may be enabled to be co-operative with another party even if the original implementation of the mobile user equipment is not co-operative with said other

10 party. Some of the embodiments enable use of an user equipment for transaction in response to a request by the user in instances wherein the user equipment has not previously been setup for processing transactions. A user equipment can also be modified to meet the latest

15 developments of the electronic transaction mechanisms. For example, the latest security functions can be introduced to the user equipment over a wireless interface.

Brief Description of Drawings

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For better understanding of the present invention, reference will now be made by way of example to the accompanying drawings in which:

Figure 1 shows a user equipment that can be used in the

25 embodiments of the present invention;

Figure 2 illustrates system architecture for an embodiment; and

Figure 3 is a flowchart illustrating the operation of one embodiment of the present invention.

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Description of Preferred Embodiments of the Invention

Figure 1 shows a user equipment that may be used in the embodiments of the present invention. More particularly, Figure 1 is a partially sectioned view of a mobile station 1 that may be used for communication over a wireless interface.

5

If the mobile station 1 subscribes to a cellular mobile communication network the mobile station 1 may be adapted to communicate with a transceiver entity of the mobile communication network. The transceiver entity may comprise a

10   base station (BTS) 10 of the cellular system or any other appropriate element with which the mobile station may communicate with. Possible transceivers entities are known by the skilled person and are thus not illustrated or described in any greater detail herein.

15

The mobile station 1 may be provided with user interface means comprising a display 2 and input means. The skilled person is familiar with the possible user interface means and communication interface means of a mobile station and

20   therefore these will not be described in more detail herein. It is sufficient to note that the input means of the user interface means may be formed e.g. by control buttons 3 or they may include e.g. voice activation or touch screen means and so on. The communication interface means may comprise

25   antenna means for communication with the transceiver entity 10. The antenna means may comprise an external antenna element 4, or then built-in or integrated antenna means may be used. It shall be appreciated that antenna means are not an essential requirement for the operation of the present

30   invention.

The mobile station 1 is adapted to facilitate the user thereof to accomplish electronic transactions with other

parties. For example, the user of the mobile station 1 may
pay for purchases of various goods services and/or or use
banking services by means of the mobile station 1. To enable
this the mobile station may be provided with a credit card
5   type transaction facility or account means wherein the user
may load money. The balance can then be deducted from the
account means whenever a payment is made. The mobile station
1 may also be used for ordering, negotiating or purchasing
goods and/or services, for receiving a receipt of a purchase
10   or for any other operation where transaction data needs to be
exchanged between the user and another party.

The mobile station 1 is shown to comprise a processor means 6
and a data storage means 7. The processor means 6 is for
15   processing and/or controlling transactions between the mobile
station and other parties. The processor means 6 may be
integrated with at least one other processor function of the
mobile station 1. The processor means may alternatively be
adapted to process data that associates with the transaction
20   processing function only. The data storage means 7 may also
be either integrated with the other functions of the mobile
station 1 or be assigned solely for the transaction data
processing functions. The separated transaction functions may
be preferred e.g. for security or usability reasons. The
25   above referenced account means may be implemented by means of
the data storage means 7.

Possible transaction processing means will be described in
more detail with reference to Figure 2 after the following
30   description of the other elements of the Figure 1
arrangement.

Figure 1 shows further a transaction management service
provider entity 12. The entity 12 controls any modification
operation of the transaction mechanism that may be used by
the mobile user equipment 1. This entity will be referred to
5   in the following by the term 'management service provider'.

As mentioned above, the mobile user equipment 1 may be a
mobile station that subscribes to a mobile communication
network. The communication network may thus provide as a
10 communication media for communication with the management
service provider 12. The mobile station 1 may access the
services provided by the management service provider 12 via
the mobile network. The service provider 12 may transport
messages to the mobile station via the network. The
15 communication between the network and the mobile station 1
occurs over a wireless interface between the base station 10
of the network and the mobile station, as is indicated by the
double headed arrow 11.

20 Thus the user may access the services provided by the service
provider entity 12 via the communication network. Messages
may be transmitted between the mobile station 1 and the
service provider 12 based on any appropriate transport
system. Examples of these include, without limiting to these,
25 Short Message Service (SMS), Wireless Application Protocol
(WAP) and Internet protocol (IP) based emails.

The functioning of elements that associate with the operation
of transaction means will now be explained by a way of
30 example with reference to Figure 2. In this example the
transaction means processing the transaction functionality
are referred to by the term 'electronic wallet'.

Figure 2 discloses a possible architecture for a system providing means for modifying the operation of an electronic wallet function in accordance with an embodiment of the present the invention. The electronic wallet function is

5   designated by block 20. The electronic wallet block 20 is shown to comprise different function blocks 21 to 24. These blocks are shown to illustrate that an electronic transaction facility may provide several different usage scenarios and that these may be implemented by means of the wallet

10   function.

Figure 2 shows blocks such as 'provision' 21, 'tickets' 22, 'receipt' 23 and 'dynamic template' 24. It shall be appreciated that these functions are not necessary in all

15   applications and that other subfunctions may also be provided in the wallet function 20.

From the exemplifying function blocks the provision block 21 refers to an ability of the mobile station 1 to update its

20   own configuration based on information provided by means of the wallet function. The user may receive to the wallet information associated e.g. with a new WAP configuration, including protocol details, gateway identifier, home page and so on. Specifically, such information can be stored as a

25   result of a transaction with a service provider.

Information of the configuration can be provided for the mobile station by means of a data card entity as will be explained in more detail later. The information may be used

30   for an immediate change in the configuration of the transaction means. The information in the data entity or the data entity may also be stored in the wallet means and used later on whenever needed.

The tickets function block 22 refers to entries that result
from a transaction. These entries may represent a certain
value that may be used for another transaction. For example,
5   an entrance ticket can be acquired to the mobile station via
a wireless connection from a ticket issuer. The ticket may
then be redeemed later on at an entrance gate thereby
enabling use of the mobile station as an authorisation device
for the entrance.
10

The function block 'receipt' 23 processes information
associated with a proof of transaction. The receipt block 23
may be adapted such that is does not normally process other
types of transactions. Specifically, the receipt block 23 may
15   be adapted such that it does not directly represent a value
that associates with a specific transaction. For example,
when a purchased good is returned, or a ticket is inspected,
it may not be necessary to present all details. Instead, the
user equipment may only represent proof that that the
20   transaction took place in the first place without revealing
all of the detailed transaction information.

The template function block 24 is for storing information
based on which the way the wallet function interacts with its
25   environment can be modified. Thus the dynamic template 24 may
be used in the reconfiguration of the transaction means. The
dynamic template block 24 may contain information such as
rules, references, parameters and so on that are required for
the operation of the electronic wallet function. That is, the
30   information stored in the dynamic template block 24 can be
used in the control of the electronic wallet function. The
template block 24 can thus be seen as means for the wallet's
own provisioning. Based on the information in the dynamic

block 24 the wallet function knows how to fill in templates. The operation of the wallet function can be changed after the user has bought the mobile station by means of a new template that has been set to the dynamic block 24. The template may

5   be "pushed" from the service provider server or then the user may download a new template by sending a request for such.

It is also possible to provide a separated support function e.g. for supporting different payment applications or

10   protocols. As these may be run "below" the normal user interface, the user may not see any difference between different applications while different standards and protocols are provided by means of the support functions. These support function may be downloaded e.g. from the

15   service provider server.

Figure 2 shows also three function blocks 28, 29 and 30. These blocks will be referred to commonly in the following by definition electronic wallet management function. At least a

20   part of the functionality of the electronic wallet management function may be controlled by the management service provider 12 of Figure 1. The mobile station may be in communication with the blocks 28 to 30 over a wireless interface.

25   The control information stored in the dynamic template 24 can be updated or otherwise modified based on a message that is received from a wallet management function. For example, if the service provider is a credit card issuer the issuer may wish to transmit new security settings or credit limit to the

30   dynamic template 24. To implement this a setup message may be generated by the setup block 29 of the management function of the service provider.

As already briefly mentioned above, the information between
the mobile station and the service provider may be
transported in a standardised data entity. An example of such
data entities is an electronic data card that can have e.g.

5   the format of the so called electronic business card or
electronic calendar.

The electronic business card content type, that is sometimes
referred to as a digital business card content type, is known

10   by the skilled person. The electronic business cards are
designed to be used instead of conventional business cards
and may be used for transmitting and interchanging contact
information and other information regarding a person or a
group of persons to a user terminal. The user terminal may be

15   an Internet enabled computer terminal, a mobile station, hand
held organiser, personal information manager, personal data
assistant, pager, fax, office equipment, and so on. That is,
the user terminal may be any device capable of processing
data in electronic form. The destination terminal may also

20   store the information it received on the electronic business
card. The data that may be transmitted on conventional
electronic business cards may include simple text, and also
elements like pictures, company logos, Web addresses, and so
on. An example of the electronic business card applications

25   that can be used for the exchange of transaction means
configuration information is marketed under trade name
'vCard'.

The contact information is typically transmitted on data

30   fields of the electronic business card. In this embodiment of
the present invention the use of the fields of the electronic
business is extended such that the information associated
with the wallet function 20 is added on the fields. This

information may be, for example, instructions to set up an electronic wallet function or instructions to modify the already existing electronic wallet mechanism.

5   When generating the information to be transported to the mobile station, e.g. the management service provider 12 may fill in the appropriate fields of the electronic data card. The transaction data may be inserted in the fields of the electronic data card e.g. in the following manner:

10

Field	Content	Example
NAME	Name of the user plus any other identity information that needs to be known	"John Smith"
Content Type	A data field that by the existence thereof tells to the mobile station that the message is for the wallet function	"Card No"; "expiry date"
DATA	Information for use by the transaction mechanism	"New value of parameter A=2"
KEY	Signature	F4f9hergn7hgsaw7fa87gUyg8gytv4IuFyt

15   The signature provides additional security for the data transportation and against fraudulent use of the modification mechanism. The digital signature may be based on any appropriate authorisation technique, such as public and/or private keys. The skilled person is aware of these techniques

20   and they will not be explained in more detail herein.

The transaction data can be transported through typical electronic business card channels, e.g. based on the vCard applications. These channels include, without limiting to

25   these email, HTTP, WAP, the short message service (SMS), Bluetooth™ and the IrDA. The electronic business cards may be stored/used in any vCard capable user equipment, such as

mobile phones, personal data assistants, e-mail enabled
devices, web browsers, WAP (wireless application protocol)
enabled devices, Bluetooth™ enabled devices and so on.

5   For example, in the WAP the content type vCard is a mandatory
feature. The vCard may be implemented as an object e.g. on a
Wireless Application Protocol (WAP) / or World Wide Web (WWW)
site. The service provider entity 12 may comprise a site
providing the page that is implemented based on appropriate
10   markup language. The possible site implementations are known
by the person skilled in the art. Examples of markup
languages include, without limiting to these, WML (Wireless
Markup Language), HTML (Hypertext Markup Language), and XHTML
(extended hypertext markup language). An appropriate mapping
15   mechanism may be used to include configuration instructions
from the page in a data entity for transportation to the
mobile station.

The user may be enabled to download a modification of the
20   electronic wallet function from the service provider entity.
The user may e.g. order an update of the wallet function by
transmitting an update request to the service provider entity
12.

25   If e.g. vCard content type is used for the messaging between
the service provider entity 12 and the user equipment 1, the
vCard can be combined with other content and transported e.g.
within a WML or HTML message. The mobile user equipment is
adapted to identify and extract vCard from the message. The
30   processing of the WML or HTML message may be handled in the
usual manner.

Content in a markup language page can be matched with content fields of a data card that is to be transmitted and may be stored in the wallet function. Each field may have an unique name or other identifier. It may be advantageous that the names of the different fields on the data card match names of the fields on the markup language page or other source of control information. The management service provider entity and/or the wallet function may also have some pre-defined settings regarding this matching. The data entity itself may provide instructions regarding the matching of the content. The information may be provided in one of the templates of the data entity.

When data e.g. from a WML page is filled in, one of the templates can be designated to provide the matching between the selected data filed (e.g. credit card details) and the WML page. Specifically, the template may be delivered together with the WML page and can be used only for the purpose of the given page.

More particularly, a wallet may store information in a form of several cards. Each card can be seen as a collection of fields, e.g. first name, last name, credit card number and so on. Each of the fields is provided with an unique identifier, such as a field name. A WML page may arrive that is to be filled in by the user. The page contains fields that should be filled in. Each field of the page also has a name, unique within the page. At least a part of the filling process can be made automatic. The wallet co-operating with the browser may be able to determine for every field from the page the matching field from the card stored in the wallet.

This matching can be achieved by different methods. Field
names may be standardised so that the e.g. the last name
is always in the field called 'Last_Name'. Field names may
not always be standardised but the wallet function is
5   provided with knowledge of how to match them, e.g. the wallet
knows that 'Last_Name' from the page should be filled in with
'L.NAME' from the card.

Such knowledge can be passed to the wallet in different
10   ways. The knowledge may be pre-programmed into the wallet.
The knowledge may also be permanently added to the wallet.
This may be done by a template. The template may be a list of
relationships between fields from the card and fields from
the page. If necessary, some formatting information may also
15   be included. The template may arrive the wallet function the
same way as other information does, e.g. as an electronic
business card and can be stored to the wallet function in the
same way as the other cards. Such a template may be
disconnected from the card or from the page - it simply
20   increases/updates the wallet's knowledge about all possible
matches between the names. This type of operation is provides
flexibility - a template can be added later than the
card/page and there can be several templates.

25   A template may also arrive with a WML page. A single WAP
response may contain several different contents, e.g. a WML
page and one or more electronic business cards. In this case
the template is an one-time template that is used
to match the specific page the template associates with with
30   an otherwise "normal" card. An advantage of this is that the
service provider need not modify his WML page but may instead
provide the template. Different templates may be used for
different types of user equipment and wallets.

The same template-based mechanism can be used for the user
equipment or wallet function provisioning. The template may
arrive also with a data card (for example two vCards may
5   arrive at the same time) so that the template
applies to the card.

The provisioning information can be sent as an electronic
data card. It is thus possible to send two data cards such
10   that one includes provisioning information and the other
includes the template. The cards can be sent together or
separated.

The following is an example of the provisioning. A user
15   equipment may have several WAP-related parameters like
calling number, gateway IP, home page and so on. All these
parameters can be provided by the operator as a single data
card to every user equipment that is using the service.
However, user equipment may be provided by different
20   manufacturers and may have different internal naming
for the same WAP-related parameter. For example, gateway
in one terminal is identified as 'Gateway_IP' while in others
as 'Gate'. The operator is aware of the manufacturer of the
different user equipment and thus the operator may send the
25   same data card to all user equipment that says:

     'my_gateway'="128.12.13.14'

However, for all user equipment coming from the first
30   manufacturer the operator may also send the data card telling

     'my_gateway'='"Gateway_IP'

while for all user equipment from the second manufacturer the operator may send a data card telling

'my_gateway'='Gate'

5

If the operator is broadcasting the data cards he can distribute the first message much faster and with less bandwidth. If the first message is distributed e.g. as part of a subsciber identity module (SIM), the first message may
10   be provided for every user equipment. The user equipment may then wait for the second message to provide provisioning information.

The wallet function may also require some other provisioning
15   information. For example, a maximum number of cards, definition of reactions on some events and so on. Such provisioning can also be done by means of 'provisioning data card' and 'template data card' so that the wallet function stores and processes its own provisioning information.
20

In the above described wallet reconfiguration process the wallet with a template can be seen as a reconfigured wallet function.

25   The service provider entity 12 may push data towards the user e.g. by means of a WAP or HTML server.

A data card handling routine can be added into the data card recognition software running in the processor means 6 of the
30   user device 1. In Figure 2 this software could be implemented in a splitter 31. The routine may also be provided by means of the browser 26. The data card handling routine may be adapted to detect that an incoming business card or similar

data entity is a data entity that contains information associated with the wallet function and to route the data entity to an appropriate data storage means for later use.

5   Figure 2 shows also a phonebook block 25. In conventional arrangements the phonebook block 25 is the usual destination of a data card such as the vcard. In the embodiments of the invention any such data card that does not associate with transactions may be routed by the splitter 31 to the

10 phonebook 25 or any other similar function instead of the wallet function 20. The user equipment may also ignore any such data card entities.

A possible data entity for the transmission of data between
15 the mobile station and the co-operative device is a data card based on the so called the Electronic Commerce Modelling Language (ECML). The ECML is an open specification that is indented for use in the exchange of purchase related information such as order and payment information in the
20 World Wide Web (WWW). The EMCL defines also a way how specific field information like names, addresses and credit card information can be formatted and transported in the WWW in a standardised manner. The wallet function of the mobile station may be adapted to automatically recognise the ECML
25 data card form in a similar manner as it recognises the vcard type data cards.

A still further example of formats that may be used for the data card is a format based on an appropriate electronic
30 calendar format. An example of the electronic calendar formats is the vCal.

Referring now also to the flowchart of Figure 3, operation in accordance with an embodiment of the present invention will be described in more detail. The exemplifying embodiment relates to a situation where the user wishes to start using a

5   new transaction mechanism. For example, the user may wish to purchase goods or services from a new merchant entity. A reference to a merchant entity shall be understood to be a reference to any organisation from which the user may purchase goods and/or services. The new merchant may use

10   transaction mechanism that is not compatible with the mechanism the mobile station is adapted to. An "old" merchant may have changed the transaction mechanism thereof in such a way that the mobile station is no longer compatible with it, and thus needs an update.

15

The user may sent to the service provider 12 a request for modification of the transaction processing means. The request may be based on e.g. a markup language or the SMS format. The request is routed to the wallet management function. After

20   the receipt of the request the management function may perform security functions, such as verification of keys or other type of authentication.

The user equipment may be identified for the authentication

25   purposes based on an identity code. Examples of the possible identity codes include, without limiting to these, the international mobile subscriber identity (IMSI) code, a unique product code assigned for each user equipment or a personal identity number (PIN) of the user.

30

After it has been determined that the mobile station in entitled to receive the requested modification, the management function generates a message including necessary

information for the modification. The message may comprise a
data entity such as the electronic data card described above.
The information is transmitted via the base station of the
cellular network to the mobile station.

5

After reception of the message it is detected at the mobile
station that the received message shall be routed to the
wallet function. The message is then directed to the wallet
function for further processing. Those features of the wallet
10   function that require modification so that they are co-
operative with the new transaction mechanism are then
changed. After the modification procedure is complete the
mobile station may be used for transactions with the new
merchant.

15

The electronic wallet function may be installed in a mobile
user equipment before the equipment is delivered to a user.
The installation can be done during the manufacture of the
user equipment. The wallet function may be installed in its
20   entirety during the manufacture of the user equipment. It is
also possible that the required hardware is installed "empty"
and the required transaction functions are then setup later
on, when required. For example, the wallet function of a
mobile user equipment can be setup just before the user
25   equipment is given to the user. The setup may be done e.g. by
the network operator.

A possibility is to setup the wallet function based on
control instruction received e.g. by means of templates from
30   a server of the remote management service provider. This can
be accomplished in a manner that is similar to the above
described update procedures.

According to a further embodiment a user equipment that has not been originally provided with a wallet function is provided with an add-on type wallet function. For example, the wallet function may be added later on to a user equipment

5 by means of a smart card or other modular wallet function. The above mechanism can then be used to initiate the added wallet function or to reconfigure the added wallet function in a similar manner as explained above.

10 In some application it may be possible to reprogram or update the control software of a mobile user equipment to provide the transaction processing means without any addition of new hardware.

15 Referring now again to Figure 1, according to an embodiment the mobile station 1 be provided with a wireless transmitter and/or receiver module 5. The module 5 is not for communication with the base station 10 of the cellular communication system, but is instead for the provision of a

20 local communication link with a co-operative device.

In this embodiment the data entities are not transmitted to and/or from the user equipment 1 via a data communication network. Instead, the communication occurs via local wireless

25 links.

The module 5 may be based on use of infrared links, short range radio links, and so on. The infrared link may be based e.g. on the IrDA. The IrDA is a standard defined by Infrared

30 Data Association. The short range radio link may be based e.g. on the Bluetooth™ protocol. The term Bluetooth™ refers to a technology specification by Bluetooth special interest group (SIG) for small factor, low-cost, short range radio

links (SRRL) between various devices provided with a
Bluetooth™ wireless modules. Another example of the short
range interfaces is based on technology used for the so
called contactless cards or proximity cards. A short range
5   link for proximity cards is defined e.g. by the International
Standardisation Organisation (ISO) specification No. ISO
14443.

A transaction may occur between the mobile user equipment and
10   a party that is connected to a data communication network
such as the IP protocol based internet. In such a case the
user may use the user equipment for transactions that
associate with the purchase of goods and/or services via the
data network. The user equipment may use any appropriate
15   communication protocol. The communication path towards the
other parties is indicated by communication means 32 in
Figure 2.

According to an embodiment the user uses his/hers mobile user
20   equipment as a means of payment instead of cash or
conventional credit or debit cards, e.g. when making a
purchase in a shop or entering a bus. The mobile user
equipment may process the transaction with a centralised
transaction handling system by communication via a
25   communication network. The user equipment may also
communicate locally with a local transaction handling device,
such as a Bluetooth™, IrDA or proximity card enabled cashier
device.

30   It should be appreciated that whilst embodiments of the
present invention have been described in relation to mobile
user devices, embodiments of the present invention are

applicable to any other suitable type of user equipment that support electronic transactions.

It is also noted herein that while the above describes exemplifying embodiments of the invention, there are several variations and modifications which may be made to the disclosed solution without departing from the scope of the present invention as defined in the appended claims.